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Time Histroy Analysis Of Multi Sorey Building For Highrise Structures

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Abstract: **Dynamic analysis can be performed by two methods one is response spectrum method and another is time history method. In response spectrum method, the values are taken as per code IS 1893 2002 but in time history method the previous Earthquake data is used. The loads which are used they are as per IS standards. In present study, the time history analysis is to be used because time history analysis is more economical then response spectrum method. Multi-story regular buildings with (G+10) stories have been modelled using software ETabs for seismic zone II in India. And by using time history method for multi-storey building the story displacement and story drift calculated. Time history analysis is also known as non-linear dynamic analysis. A time history is the advanced method of dynamic analysis. The time history analysis method is also capability to incorporate harmonic forcing function which can described by sinusoidal curves with a specified arrival time, frequency, amplitude, and duration.**

Keywords: **Dynamic Analysis, G+10, ETABS, Time History Analysis, Capacity, Earthquakes.**

I. INTRODUCTION:

In the earthquake, prone regions, the chance of failure of building is increase due to act of earthquake. Because the various seismic force act on the building when the earthquake come in that region. The building which do not resist these seismic forces they may suffer extensive damage, collapse or break. To improve or save these building the seismic evaluation is required therefore the dynamic and statics analysis is required. Therefore, it is necessary to study the variation in seismic behaviour of multi-storeyed RC building in terms of various responses such as story displacement and story drift. In this paper, a multi-story regular building with 10 stories has been modelled using software ETABS for seismic zone II in India. And calculate the story displacement and story drift. In this paper the time history method is used to determine the story displacement and story drift. The time history method is more economical then response spectrum method. All over world, there is high demand for construction of tall buildings due to increasing urbanization and spiralling population, and earthquakes have the potential for causing the greatest damages to those tall structures. Reinforced concrete multi-storied buildings are very complex to model as structural systems for analysis. Usually, they are modeled as two-dimensional or three-dimensional frame systems using finite beam elements. Since earthquake forces are random in nature and unpredictable, the engineering tools need to be sharpened for analyzing structures under the action of these forces. Earthquake loads are required to be carefully modelled so as to assess the real behaviour of structure with a clear understanding that damage is expected but it should be regulated. Analyzing the structure for past earthquakes of different intensities and checking for multiple criteria at each level has become essential and pivotal these days." "The main parameters of the seismic analysis of structures are load carrying capacity, ductility, stiffness, damping and mass. The design can be divided into two main steps. First, a linear analysis is conducted with appropriate dimensioning of all structural elements, ensuring the functionality of the structure after minor earthquakes, and then the behaviour of structures during strong earthquakes has to be controlled using nonlinear methods. Dynamic analysis should be performed for symmetrical as well as unsymmetrical building. Due to unsymmetrical section of building the major parameter to be considered is Torque. The structural engineers perform for both regular as well as irregular buildings." "The current version of the IS: 1893 - 2002 requires that practically all multi-storeyed buildings be analyzed as three-dimensional systems. This is due to the fact that the buildings have generally irregularities in plan or elevation or in both. Further, seismic intensities have been upgraded in weaker zones as compared to the last version IS: 1893-1984. It has now indirectly become mandatory to analyze all multi-storeyed buildings in the country for seismic forces

II. RELATED STUDY:

This approach defines a series of forces acting on a building to represent the effect of earthquake ground motion, typically defined by a seismic design response spectrum. It assumes that the building responds in its fundamental mode. For this to be true, the building must be low-rise and must not twist significantly when the ground moves. The response is read from a design response spectrum, given the natural frequency of the building (either calculated or defined by the building code). The applicability of this method is extended in many building codes by applying factors to account for higher buildings with some higher modes, and for low levels of twisting. To account for effects due to "yielding" of the structure, many codes apply modification factors that reduce the design forces (e.g. force reduction factors). This approach permits the multiple modes of response of a building to be taken into account (in the frequency domain). This is required in many building codes for all except for very simple or very complex structures. The response of a structure can be defined as a combination of many special shapes (modes) that in a vibrating string correspond to the "harmonics". Computer analysis can be used to determine these modes for a structure. For each mode, a response is read from the design spectrum, based on the modal frequency and the modal mass, and they are then combined to provide an estimate of the total response of the structure. In this we have to calculate the magnitude of forces in all directions i.e. X, Y & Z and then see the effects on the building.

III. METHODOLOGY AND ANALYSIS:

Static procedures are appropriate when higher mode effects are not significant. This is generally true for short, regular buildings. Therefore, for tall buildings, buildings with tensional irregularities, or non-orthogonal systems, a dynamic procedure is required. In the linear dynamic procedure, the building is modelled as a multi-degree-of-freedom (MDOF) system with a linear elastic stiffness matrix and an equivalent viscous damping matrix. The seismic input is modelled using either modal spectral analysis or time history analysis but in both cases, the corresponding internal forces and displacements are determined using linear elastic analysis. The advantage of these linear dynamic procedures with respect to linear static procedures is that higher modes can be considered. However, they are based on linear elastic response and hence the applicability decreases with increasing nonlinear behaviour, which is approximated by global force reduction factors. In linear dynamic analysis, the response of the structure to ground motion is calculated in the time domain, and all phase information is therefore maintained. Only linear properties are assumed. The analytical method can use modal decomposition as a means of reducing the degrees of freedom in the analysis. Nonlinear dynamic analysis utilizes the combination of ground motion records with a detailed structural model, therefore is capable of producing results with relatively low uncertainty. In nonlinear dynamic analyses, the detailed structural model subjected to a ground-motion record produces estimates of component deformations for each degree of freedom in the model and the modal responses are combined using schemes such as the square-root-sum-of-squares. In non-linear dynamic analysis, the non-linear properties of the structure are considered as part of a time domain analysis. This approach is the most rigorous, and is required by some building codes for buildings of unusual configuration or of special importance. However, the calculated response can be very sensitive to the characteristics of the individual ground motion used as seismic input; therefore, several analyses are required using different ground motion records to achieve a reliable estimation of the probabilistic distribution of structural response. Since the properties of the seismic response depend on the intensity, or severity, of the seismic shaking, a comprehensive assessment calls for numerous nonlinear dynamic analyses at various levels of intensity to represent different possible earthquake scenarios. This has led to the emergence of methods like the Incremental Dynamic Analysis. Code books play a major role in the analysis and design of any structure. A building has to perform many functions satisfactorily. Amongst these functions are the utility of the building for the intended use and occupancy, structural safety, fire safety and compliance with hygienic, sanitation, ventilation and daylight standards. The design of the building is dependent upon the minimum requirements prescribed for each of the above functions. The minimum requirements pertaining to the structural safety of the buildings are being covered in different codes. Code books are referred to reduce the hazards to life and property caused by unsafe structures, but also eliminates the wastage caused by assuming unnecessarily heavy loadings without proper assessment.

IV. EXPERIMENTAL RESULTS

The results of Analysis of RCC frame. Analysis of RCC frame under the static loads has been performed using E-TABS software. Subsequently these results are compared and Analysed for Five Storey Full Scale Reinforced concrete Structure under static loads Loads".

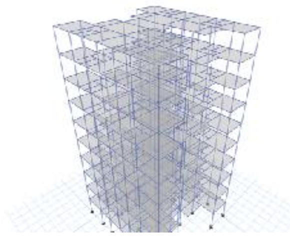

Fig.4.1. Design model.

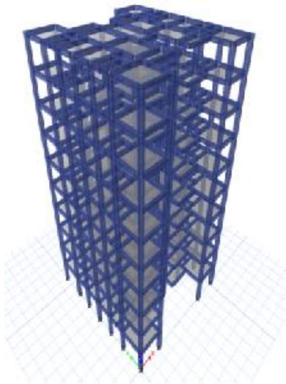

Fig.4.2. 3D model.

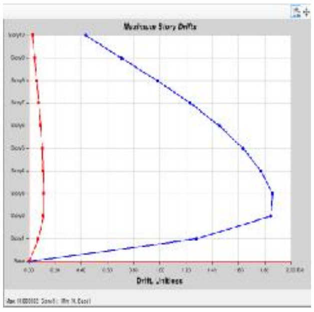

Fig.4.3. Story Drifts.

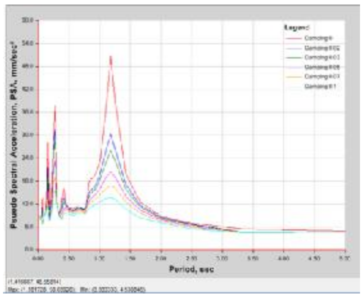

Fig.4.4. Acceleration graph.

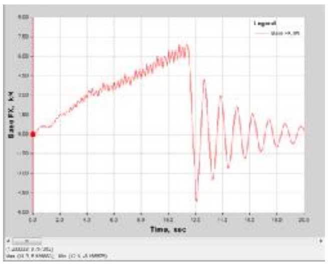

Fig.4.5. Periodic Function X Direction.

V. CONCLUSION:

In this paper the story displacement and story drift is calculated. The story drift is maximum at first floor and zero at base and minimum at the top of the building. The story drift slightly decrease with increase the story height. And in case of story displacement it is minimum at base and maximum at the top floor. The story displacement is increase with increase number of story. In this paper the displacement and acceleration graph is also calculated at base, intermediate and top floor. With increase the story height the value of displacement and acceleration is also increase and the graph between displacement and time is also different at base and 3rd floor and 10th floor.

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